Center Independent Research & Development: GSFC IRAD

Design, Fabrication, and Analysis of High-Performance UV Band-pass filters

Completed Technology Project (2015 - 2016)

Project Introduction

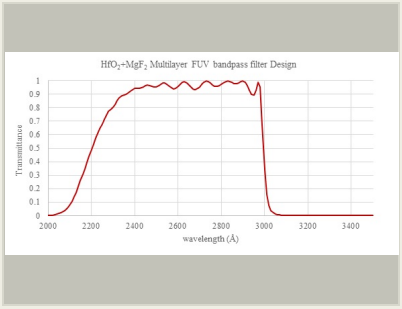
NASA's strategic mission concept, ATLAST (Advanced Technology Large-Aperture Space Telescope), is a telescope merging ultraviolet (UV) astrophysics and visible exoplanet science. We propose to investigate high-performance visible blind UV band-pass filter coatings with high transmission in the Far-Ultra Violet (FUV) spectral range for the instrument's detector technology. The coating performance will be evaluated both theoretically and experimentally in the context of meeting requirements for exoplanet research.

High-performance mirror coatings were identified as one of five key technology development priorities in the ATLAST Science, Mission, and Technology Roadmap. One of the challenges of merging UV astrophysics with visible-wavelength exoplanet science is to design a multilayer coating which provides high transmittance in the UV spectrum while eliminating the visible. ATLAST requires coatings that have a high reflectivity over a broad bandwidth; therefore, it is crucial the detector has high sensitivity in the FUV while blocking the visible so the appropriate science at each spectral bandwidth can be conducted. The scope of this work involves determining the best combination of materials that have minimal hygroscopic properties for a dielectric FUV multilayer band-pass filter design. By using materials with low absorption in this spectral range, detector sensitivity and the detectable redshift range will be enhanced. Coupling enhanced FUV coated optics with this detector technology will be game changing as it will yield more sensitive instruments and more design freedoms in an optical system.

Anticipated Benefits

The proposed technologies will increase the capabilities of UV imaging spectrographs. They will:

- Allow for more sensitive instruments in the Ultraviolet spectral range
- Permit more instument design freedom
- Allow for more environmentally stable coatings



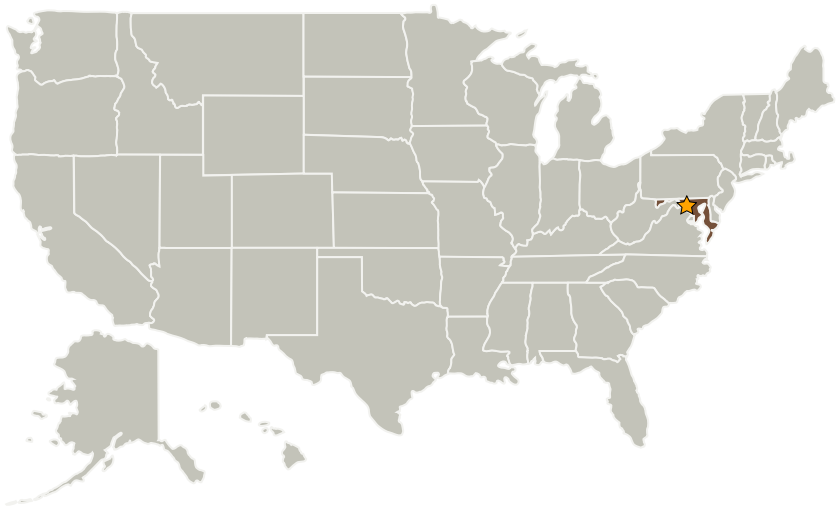
High/Low index material multilayer filter design using Hafnium Oxide as the high index and Magnesium Fluoride as the low index

Table of Contents

Design, Fabrication, and Analysis of High-Performance UV Band-pass filters

Completed Technology Project (2015 - 2016)

Primary U.S. Work Locations and Key Partners



Organizations Performing Work	Role	Type	Location
★Goddard Space Flight Center(GSFC)	Lead Organization	NASA Center	Greenbelt, Maryland

Primary U.S. Work Locations
Maryland

Organizational Responsibility

Responsible Mission Directorate:

Mission Support Directorate (MSD)

Lead Center / Facility:

Goddard Space Flight Center (GSFC)

Responsible Program:

Center Independent Research & Development: GSFC IRAD

Project Management

Program Manager:

Peter M Hughes

Project Managers:

Terence A Doiron
Stanley D Hunter

Principal Investigator:

Javier G Del Hoyo

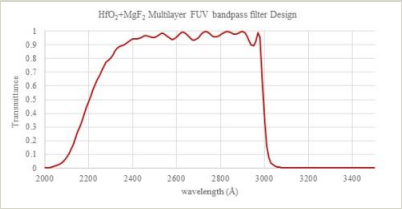
Co-Investigator:

Manuel A Quijada

Design, Fabrication, and Analysis of High-Performance UV Band-pass filters

Completed Technology Project (2015 - 2016)

Images



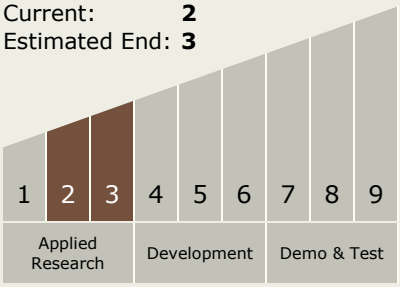
Multilayer FUV band-pass filter design
High/Low index material multilayer filter design using Hafnium Oxide as the high index and Magnesium Fluoride as the low index *(https://techport.nasa.gov/image/19105)*

Project Website:

http://aetd.gsfc.nasa.gov/

Technology Maturity (TRL)

Start: **2**
Current: **2**
Estimated End: **3**



Technology Areas

Primary:

- TX08 Sensors and Instruments
  - TX08.1 Remote Sensing Instruments/Sensors
    - TX08.1.3 Optical Components

Other/Cross-cutting:

- TX08 Sensors and Instruments
  - TX08.1 Remote Sensing Instruments/Sensors
    - TX08.1.1 Detectors and Focal Planes